STUDIES ON THE BRYOPHYTES OF SOUTHERN MANITOBA
III. COLLECTIONS FROM GRAND BEACH PROVINCIAL PARK

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Grand Beach Provincial Park lies approximately 57 miles north of Winnipeg. The entire park, which covers 59,000 acres, is in the Manitoba Lowlands Section of the Boreal Forest Region (Rowe, 1959). Three miles of the area fronts on Lake Winnipeg. The underlying bedrock is palaeozoic limestone, and the overlying beds are modified till, or lacustrine clays deposited in glacial Lake Agassiz. Most soils have a high lime content.

On the flat, poorly drained areas, black spruce (*Picea mariana* (Mill.) BSP.) and tamarack (*Larix laricina* (Du Roi) K. Kich) forest prevail, while on the better drained alluvial strips bordering the rivers and creeks, white spruce (*Picea glauca* (Moench) Voss), aspen (*Populus tremuloides* Michx.) and balsam poplar (*Populus balsamifera* L.) predominate. On the low, well-drained ridges, jack pine (*Pinus banksiana* Lamb.) is dominant, with aspen, paper birch (*Betula papyrifera* Marsh.) and some bur oak (*Quercus macrocarpa* Michx.) present.

No bryophytes have previously been reported for the park. In the present study, several sites were visited, mostly in the vicinity of 96°35′W and 50°33′N. The sites were chosen as representative of the major vegetation types in the area, and the following seven, visited in July, 1972, are reported as representative of the area studied. Several of the vascular collections could be determined to genus only, because of lack of flowering or fruiting material.

1. Sand dunes and dune slacks behind the East Beach. Dominant shrubs were *Salix* spp., especially in the slacks, with *Prunus pumila* L. conspicuous on the drier areas. Other prominent vascular plants on the dry areas included *Carex* spp., *Rhus radicans* L. var. *rydbergii* (Small)

Rehder, and *Artemisia* spp. Total plant cover was rather thin (about 20%) except in the slacks, and most bryophyte cover was on wet litter in the slacks. Small turf mosses such as *Bryum* spp. were, however, common in dry habitats.

2. Aspen-dominated forest just s. of the parking lot at the East Beach. Most mosses were from tree bases.
3. Mixed mature aspen — jack pine forest on w. side of the road n. of main park entrance.
4. Black spruce bog with some tamarack and white cedar (*Thuja occidentalis* L.). The understory was dominated by *Ledum groenlandicum* Oeder and the terrain consisted of pools and *Carex* hummocks. Just s. of Highway 12, ½ mile from its junction with Highway 59.
5. Open jack pine with some birch, on s. side of Highway 12, 2 miles from its junction with Highway 59.
6. Tamarack — black spruce bog on e. side of Highway 59, 2 miles n. of its junction with Highway 12. Drier than site 4, and with a tall shrub layer of *Alnus* sp., as well as a short shrub layer dominated by *Ledum groenlandicum*. Deadfall was abundant.
7. Mature, open jack pine forest on w. side of Highway 59 4 miles n. of its junction with Highway 12. There was an open short shrub and herb layer dominated by *Vaccinium angustifolium* Ait., *Chimaphila umbellata* (L.) Bart. and *Amelanchier alnifolia* Nutt., with *Linnaea borealis* L. and *Vicia americana* Muhl. prominent. The forest floor was dominated by *Pleurozium schreberi* and *Dicranum* spp., especially *D. polysetum*. The many large humus-covered boulders present all had an extensive, species-rich bryophyte cover. Numbers in the species list refer to the sites described above.

Taxonomic and field work were shared equally by both authors. Voucher specimens have been deposited in the authors' own herbarium and at the University of Winnipeg. Nomenclature for Sphagnobrya and Eubrya follows Crum, Steere, and Anderson (1965) with modification according to Crum (1971). Hepatic nomenclature follows Schuster

(1969), supplemented by Schuster (1953) with abbreviations of authorities amended to conform with the list of Sayre, Bonner and Culberson (1964). Vascular plant nomenclature follows Scoggan (1957).

Hepaticae

Calypogeia muelleriana (Schiffn.) K. Müll. (6). Three collections, two on humus mixed with well-rotted wood, and one on a rotten stump with *Lophocolea heterophylla, Cephalozia media* and *Hypnum pallescens*. Only once previously recorded for the province (Longton, 1972).

Cephalozia media Lindb. (6). One collection, on a rotten stump.

Cephaloziella rubella (Nees) Douin (4). On humus over rotten wood, with *Amblystegium juratzkanum, Chiloscyphus pallescens* and *Thuidium recognitum.*

Chiloscyphus pallescens (Ehrh.) Dum. (4). Only once previously recorded for the province, in Spruce Woods Provincial Park (Stringer & Stringer, *a*, in preparation).

Chiloscyphus polyanthus (L.) Corda (3, 4). On bark at the base of an aspen tree (3) with *Hypnum pallescens*, and on humus with *Distichium inclinatum.* Recorded previously only in Spruce Woods Provincial Park (Stringer & Stringer, in preparation).

Lophocolea heterophylla (Schrad.) Dum. (3, 6, 7,). On humus or rotten wood, often with *Pohlia nutans* or *Hypnum pallescens.* Previously recorded only in the Spruce Woods area by Bird (1969) and by Stringer & Stringer (in preparation).

Lophocolea minor Nees (6). On thick humus (dead *Aulacomnium palustre*), with *Pohlia nutans* and *Eurhynchium pulchellum.* Not previously recorded for the province.

Ptilidium ciliare (L.) Nees (5, 6, 7,). On loose humus or litter with *Dicranum* spp. and *Pleurozium schreberi.* One collection (7) on loose conifer needles over rock, with *Hedwigia ciliata.*

Ptilidium pulcherrimum (Web.) Hampe (7). One collection, on fallen birch bark.

Radula complanata (L.) Dum. (7) One collection, on packed humus at the base of a jack pine tree.

Riccardia pinguis (L.) S. Gray (4). On thick, moist humus mixed with silt, with *Myurella julacea, Amblystegium juratzkanum* and *Platydictya jungermannoides.* Previously recorded only in the Spruce Woods area by Bird (1969) and Stringer & Stringer (in preparation).

Sphagnobrya

Sphagnum capillaceum (Weiss) Schrank (6). In deep hummocks, with *Pleurozium schreberi.*

Eubrya

Amblystegium juratzkanum Schimp. (1, 2, 4, 5, 6, 7). On rotten wood or humus, especially at tree bases, where it was often found with *Pylaisiella polyantha* and *Brachythecium salebrosum.*

Amblystegium varium (Hedw.) Lindb. (1, 2, 6). On thick humus and rotten wood, with *Brachythecium* spp. and *Mnium cuspidatum.*

Aulacomnium palustre (Hedw.) Schwaegr. (4, 5, 6). On thick humus, in deep pure sods, or with *Pleurozium schreberi.* One collection (5) on rotting birch bark.

Brachythecium campestre (C. Müll.) B. S. G. (5, 6, 7). On humus, usually over well-drained sandy soil. Previously recorded in Manitoba only in the Winnipeg and Spruce Woods areas by Stringer & Stringer (1973) and Stringer & Stringer (in preparation).

Brachythecium rutabulum (Hedw.) B. S. G. (1, 2, 5, 6, 7). On humus or rotten wood in moist habitats. Previously recorded only by Mueller-Dombois (1964), Longton (1972), and by Stringer & Stringer (in preparation), in the Spruce Woods area.

Brachythecium salebrosum (Web. and Mohr) B. S. G. (1, 2, 3, 5, 6, 7). Common in many habitats, especially on tree bases.

Bryoerythrophyllum recurvirostrum (Hedw.) Chen (4). On thick humus, with *Amblystegium juratzkanum, Myurella julacea* and *Platydictya jungermannoides.*

Bryum angustirete Kindb. ex Mac. (1). On humus over sand, alone, and with *Encalypta procera.*

Bryum argenteum Hedw. (1, 3). On dry humus and sand. Often with *Funaria hygrometrica.*

Bryum creberrimum Tayl. (3, 5). On humus mixed with sand. Often with *Ceratodon purpureus.*

Bryum pallescens Schleich. ex Schwaegr. (1, 2, 3). On humus in moist habitats.

Bryum pseudotriquetrum (Hedw.) Gaertn., Meyer and Scherb. (2, 4). On thick, moist humus with *Campylium stellatum* and *Brachythecium rutabulum.*

Callicladium haldanianum (Grev.) Crum (5, 6, 7). On humus and moist rotten wood. Previously reported only in the Winnipeg and Spruce Woods areas by Bird (1969) and by Stringer & Stringer (*a*, in preparation).

Calliergon giganteum (Schimp.) Kindb. (4). On water-logged litter, in large masses mixed with *Campylium stellatum.*

Campylium chrysophyllum (Brid.) J. Lange (4). On well-rotted wood and humus.

Campylium hispidulum (Brid.) Mitt. (4). One collection, on humus. with *Amblystegium juratzkanum.*

Campylium stellatum (Hedw.) C. Jens. (4, 6). On wet humus or litter, often with *Mnium affine* or *Thuidium delicatulum* var. *radicans.*

Ceratodon purpureus (Hedw.) Brid. (1, 3, 4, 5, 7). On humus over dry sand, with *Bryum* spp., *Funaria hygrometrica,* or *Polytrichum juniperinum.*

Dicranum bonjeanii De Not. ex Lisa (7). On thick humus over rotten wood, with *D. polysetum* and *Ptilidium ciliare.*

Dicranum drummondii C. Müll. (6, 7). In thick, deep, pure clumps on humus, or as small plants on rotten wood with such typical species of decayed wood as *Pohlia nutans* and *Tetraphis pellucida.*

Dicranum fuscescens Turn. (5, 7). On humus or rotten wood, usually in pure tufts.

Dicranun polysetum Sw. (4, 5, 6, 7). Common, especially in jack pine forests of the area. Forms deep pure tufts. Often found also with *Pleurozium schreberi.*

Distichium inclinatum (Hedw.) B. S. G. (4). Common in this collecting area and most often found with *Myurella julacea, Amblystegium juratzkanum,* and *Platydictya jungermannoides.* Several of the collections had mature capsules, and the large warty spores (35μ-40μ) distinguish this species from the closely related *Distichium capillaceum* (Grout, 1936).

Drepanocladus aduncus (Hedw.) Warnst. (1). On wet litter under willows.

Drepanocladus aduncus (Hedw.) Warnst. var. *polycarpus* (Bland. ex Voit) Roth (1, 2). More commonly found than the preceding, this variety occurred on moist humus or litter, often with *Leptodictyum riparium.*

Drepanocladus revolvens (Sw.) Warnst. (4). Several collections made on wet litter or humus, in pure mats or with *Pleurozium schreberi* and *Thuidium recognitum.*

Drepanocladus uncinatus (Hedw.) Warnst. (4, 5, 6, 7). On rotten wood or humus, in drier habitats than other members of the genus. With *Brachythecium* spp. and *Bryum* spp.

Encalypta procera Bruch (1). One collection, on thin humus over dry sand.

Eurhynchium pulchellum (Hedw.) Jenn. (4, 6, 7). On thick humus or litter in both wet and dry habitats.

Fissidens adianthoides Hedw. (4). One small collection, with *Campylium stellatum,* on loose, moist humus. Not previously recorded for the province.

Funaria hygrometrica Hedw. (1, 4, 5, 7). Frequent on sandy soil, often mixed with ashes of old fires. Commonly with *Bryum* spp., *Ceratodon purpureus,* and *Leptobryum pyriforme.*

Haplocladium microphyllum (Hedw.) Broth. (2, 3, 6, 7). Almost all collections on rotten wood but one collection (7) on humus.

Hedwigia ciliata (Hedw.) P. Beauv. (7). Several collections, all on humus over rock or loose conifer needles over rock.

Hylocomium splendens (Hedw.) B. S. G. (4, 6, 7). On litter and loose humus, often with *Pleurozium schreberi.*

Hypnum lindbergii Mitt. (4, 5, 6). Usually on wet, well-rotted wood or wet humus.

Hypnum pallescens (Hedw.) P. Beauv. (3, 5, 6, 7). Common on live and fallen bark of both conifers and hardwoods. Often associated with *Pylaisiella polyantha.*

Hypnum pratense Koch ex Spruce (1). One collection, on wet rotten bark with *Drepanocladus aduncus* var. *polycarpus.*

Isopterygium turfaceum (Lindb.) Lindb. (7). One collection, on thick humus over granite rock, with *Pohlia nutans* and *Brachythecium rutabulum.*

Leptobryum pyriforme (Hedw.) Wils. (1, 2, 4, 7). Common on a wide variety of substrates and with a wide range of associated species.

Leptodictyum riparium (Hedw.) Warnst. (1, 2). On wet humus or litter, often with *Drepanocladus aduncus* or *Amblystegium varium.*

Leptodictyum trichopodium (Schultz) Warnst. var. *kochii* (B. S. G.) Broth. (1, 2). On deadfall or humus in moist habitats.

Leskea polycarpa Hedw. (1, 2, 5). On bark or humus, found most often with *Amblystegium varium* or *Leptodictyum trichopodium* var. *kochii.*

Mnium affine Bland. ex Funck (4, 6). On wet humus or disintegrated rotten wood.

Mnium cuspidatum Hedw. (1, 2, 3, 5, 6). On humus, rotten wood or litter in drier habitats than *M. affine,* often alone, or with *Brachythecium salebrosum.*

Myurella julacea (Schwaegr.) B. S. G. (4). Common in wet habitats in this collecting area and often found with *Campylium stellatum* and *Aulacomnium palustre.*

Orthotrichum obtusifolium Brid. (3). One collection, on poplar bark, with *Hypnum pallescens.*

Orthotrichum speciosum Nees ex Sturm (3, 7). On live poplar bark, often with *Pylaisiella polyantha*, but persisting on deadfall even in advanced stages of decay where it often occurs with *Haplocladium microphyllum*.

Platydictya jungermannioides (Brid.) Crum (4). Fairly common in this collecting area, with *Myurella* and *Distichium*. Recorded only once previously for the province, as *Amblystegiella sprucei* (Bruch) Loeske, by Crum and Schofield (1959).

Pleurozium schreberi (Brid.) Mitt. (3, 4, 5, 6, 7). Common, and often forming large pure colonies in both wet and dry coniferous forests.

Pohlia nutans (Hedw.) Lindb. (5, 6, 7). Usually on well-rotted wood but sometimes (7) on humus.

Polytrichum juniperinum Hedw. (5, 6, 7). Usually on humus over sand in drier habitats.

Polytrichum piliferum Hedw. (7). One collection on humus over sand.

Ptilium crista-castrensis (Hedw.) De Not. (5, 7). Usually a forest floor species of dry coniferous forests in the area, occurring on loose humus or needle litter over sand.

Pylaisiella polyantha (Hedw.) Grout (2, 3, 5, 6, 7). Common with *Orthotrichum speciosum*, especially on bark of live hardwoods, but also on humus (6, 7) or at the base of jack pine (5).

Tetraphis pellucida Hedw. (6). On well-rotted wood, with *Pohlia nutans* and *Drepanocladus uncinatus*.

Thuidium delicatulum (Hedw.) B. S. G. var. *radicans* Crum, Steere & Anderson (4). On loose wet humus and litter with *Hypnum lindbergii*, *Campylium stellatum* and *Tomenthypnum nitens*.

Thuidium recognitum (Hedw.) Lindb. (4, 6). On loose humus and needle litter in wet or moist habitats.

Tomenthypnum nitens (Hedw.) Loeske (4). On loose, wet humus and litter.

Tortula ruralis (Hedw.) Gaertn., Meyer & Scherb. (7). On thin humus over sand.

DISCUSSION

A search of the literature reveals that little work has been done on the bryophytes of Manitoba. Bird (1966), who gives a comprehensive list of the recordings for the province, lists only 289 taxa of bryophytes for the whole of Manitoba. This list has been somewhat augmented by Bird (1969) and Longton (1972), but published work on the bryophyte flora of the province is still greatly lacking. This situation is especially unfortunate as Manitoba is particularly interesting from a phytogeographic point of view, lying as it does at a "crossroads of floral elements, from both north and south, east and west" (Löve, 1959).

Approximately half of the species recorded in the present study are pan-North American in distribution, according to the designations given by Bird (1969) and Bird and Won Shic Hong (1969). However, the Boreal element is represented by species such as *Dicranum fuscescens, D. polysetum, Tetraphis pellucida, Myurella julacea, Thuidium delicatulum* var. *radicans, Thuidium recognitum, Pleurozium schreberi, Ptilium crista-castrensis,* and *Pylaisiella polyantha.* The Arctic Boreal element is represented by *Dicranum bonjeanii, Bryoerythrophyllum recurvirostrum, Bryum pallescens, Orthotrichum speciosum, Calliergon giganteum, Campylium stellatum, Eurhynchium pulchellum, Tomenthypnum nitens, Hylocomium splendens, Polytrichum juniperinum,* and *Polytrichum piliferum.* A few Eastern Boreal species are also present, i.e. *Dicranum drummondii, Leptodictyum trichopodium* var. *kochii* and *Callicladium haldanianum.*

The hepatics are largely pan-North American species. *Cephaloziella rubella,* however, is Boreal and *Ptilidium ciliare* is Arctic Boreal (Bird & Won Shic Hong, 1969). *Calypogeia muelleriana* and *Cephalozia media* have been previously recorded only from the north-east part of the province, from Churchill and York Factory respectively (Longton, 1972). The only previous record of *Cephaloziella rubella* was from Spruce Woods Provincial Park (Stringer

& Stringer, in preparation). *Lophocolea minor*, recorded from Grand Beach as new to the province, has since been found at several stations in Birds Hill and Whiteshell Provincial Parks, where *Radula complanata* is also quite frequent. *Riccardia pinguis* has only two previous records, both from Spruce Woods Provincial Park, although subsequent work by the authors shows that it is common on the calcareous clays of the southern part of the province. All of these liverworts are probably much more widely distributed throughout the province than the scant records indicate.

Several moss species which, according to the literature, should have a wide distribution have few records in Manitoba. This is especially true of *Brachythecium* spp., perhaps because of the apparent scarcity of fertile material and the consequent difficulty in making a positive identification. *Brachythecium rutabulum*, common in the Grand Beach area studied, was reported as new to the province by Longton (1972), although Mueller-Dombois (1964) described it as one of the mosses forming the typically continuous carpet in one of the jack pine — black spruce forest types in southeastern Manitoba. The only other records of *Brachythecium campestre* are also from the southern part of the province (Stringer & Stringer, in preparation, 1973) although this species appears to have a pan-North American distribution.

Callicladium haldanianum, reported for the first time in the province by Bird (1969) as *Heterophyllium haldanianum* (Grev.) Kindb., reaches its western limit in Manitoba. The Grand Beach record is further north than either of the Bird records.

Fissidens adianthoides, a new record for Manitoba, appears to be rare in western Canada (Bird 1966), although Grout (1936) gives its distribution as from Cape Breton Island to Vancouver Island and south to California and Florida.

It is intended that the information presented in this study should, in conjunction with information presented in

further papers in this series, assist in describing the bryophyte flora of Manitoba and its relationships with the floras of adjacent regions.

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